CHAPTER III - RESEARCH & DEVELOPMENT SUMMARY

1. GENERAL

One of the tasks of the Joint Typhoon Warning Center is to conduct applied tropical cyclone research, as time and resources permit. The objective of this research is to improve operational forecasts. This research primarily involves the development of forecasting and analysis techniques from published studies and preparing reports requested by outside agencies. Meteorologists from agencies such as the Naval Environmental Prediction Research Facility, the Naval Postgraduate School, Det 4, HQ Air Weather Service, Det 1, 1st Weather Wing and the 54th Weather Reconnaissance Squadron often collaborate on these projects. The following abstracts summarize the year's research and development projects completed or still in progress.

2. OPERATIONAL APPLICATION OF A TROPICAL CYCLONE RECURVATURE/NON-RECURVATURE STUDY BASED ON 200MB WIND FIELDS

(Guard, C. P., FLEWEACEN/JTWC TECH NOTE 77-1)

In his paper, Tropical Cyclone Motion and Surrounding Parameter Relationships, John E. George demonstrated the relationship between various 200 mb wind fields and recurvature/non-recurvature. Evaluation of the wind fields with data independent of George's study indicated that significant modification of his study was required to produce an operationally applicable recurvature/non-recurvature study. Synoptic analysis revealed two distinct environments affecting tropical cyclones, a Winter Regime and a Summer Regime. All tropical cyclones were stratified accordingly. By integrating the results of the evaluation with results from rigorous synoptic and statistical analyses, operationally applicable recurvature/non-recurvature techniques were developed for, both, Winter Regime and the Summer Regime tropical cyclones.

3. TROPICAL CYCLONE CENTER FIX DATA FOR THE 1976 STORM SEASON

(Staff, FLEWEACEN/JTWC TECH NOTE 77-2)

This publication is a listing of all center fix data for each tropical cyclone occurring in the western North Pacific, Bay of Bengal, and Arabian Sea during 1976. (Note: The 1977 center fix data is included in Chapter VI herein, and will not be published as a separate report.)

4. EVALUATION OF THE DVORAK IR TECHNIQUE FOR USE WITH DMSP DATA

(Corey, T. D., DET 1, 1ST WEATHER WING)

An evaluation was made of the Dvorak IR technique (1975) using nighttime DMSP IR data. The data included all tropical storms and typhoons occurring during the period 1 June through 31 December 1976. A comparison was made between the Dvorak IR intensity estimate and the corresponding best track intensity. The results showed that the Dvorak IR technique is useful in describing intensity trends but not in making independent intensity estimates.

5. A CLIMATOLOGY OF TROPICAL CYCLONES FOR THE PERIOD 1971-1976

(Willms, G. R., FLEWEACEN/JTWC)

An analysis was made of all tropical cyclones occurring in the JTWC area of responsibility during 1971-1976. The analysis determined: the average speed of tropical cyclones, by month, traversing each 5° latitude/longitude square in the western North Pacific; and the average annual number of occurrences of tropical cyclones by 5° latitude/longitude square in the western North Pacific, Bay of Bengal and Arabian Sea. This study updated previous work.

6. RELATIONSHIPS BETWEEN THE TEMPORAL VARIATION OF EQUIVALENT POTENTIAL TEMPERATURE AND TROPICAL CYCLONE INTENSITY

(Hassebrock, A. W., FLEWEACEN/JTWC)

The use of equivalent potential temperature as a predictor of tropical cyclone intensity has been studied previously by Sikora (ATR, 1975) and Milwer (ATR, 1976). These studies examined the equivalent potential temperature (magnitude) in relation to tropical cyclone intensity and found inconclusive results. In this study, aircraft center fix data for 1976-1977 tropical cyclones were analyzed to determine if temporal variations, versus magnitude, of equivalent potential temperature had any relationship with tropical cyclone intensification. Two types of variations were found which show potential as intensity forecasting aids. These two techniques will be evaluated during the 1978 storm season.

7. THE TRANSITIONING OF TROPICAL CYCLONES TO EXTRATROPICAL CYCLONES

(Guard, C. P., FLEWEACEN/JTWC and Brand, Samson, NEPRF)

An examination was made of the post-recurvature transition of tropical cyclones to extratropical cyclones. Particular emphasis is placed on the short-lived intensification that tropical cyclones sometimes undergo after recurvature, as cold air is initially advected into the region of the wall cloud.

8. FUTURE AIRCRAFT RECONNAISSANCE STORM TRACKS

(Staff, FLEWEACEN/JTWC, DET 4, HQ AWS AND 54 WRS)

An examination was made of storm tracks needed to satisfy future data requirements. New tracks were developed to provide increased peripheral data for the 1978 season. Additional tracks were discussed which may be

required to provide the necessary input data for the FNWC Tropical Cyclone Model.

9. TROPICAL CHART SERIES FOR SEPTEMBER 1975

(Sokol, D., Willms, G. R. and Guard, C. P., FLEWEACEN/JTWC)

A series of surface/gradient and 200 mb charts were prepared for the Naval Postgraduate School. These charts depicted a period of high storm activity during September 1975 and are now an integral part of the laboratory instruction at the school.

10. TROPICAL WEATHER STUDY GUIDE

(Fukada, E. M., FLEWEACEN/JTWC)

A study guide on tropical weather was prepared for the Navy Forecasters School. The study guide, which was in a programmed text format, discusses the climatology, synoptics and dynamics of tropical weather.

Note: Anyone desiring additional information on any of the above subjects should contact the Director, JTWC.